

## COMBAT BETWEEN MALES OF *POGONORTALIS DOCLEA* (DIPTERA, PLATYSTOMATIDAE) AND ITS RELATION TO STRUCTURAL MODIFICATION

By David K. McAlpine  
The Australian Museum, Sydney

### Abstract

Sexual modifications of the head in *Pogonortalis doclea* (Walker) and other platystomatid flies are described. Territorial fighting among males of *P. doclea* is described and the function of the broadened head and fascicles of cheek bristles is explained. The possibility of cephalic modifications in the males of other acalyprate flies being used in a similar fashion is considered.

### Introduction

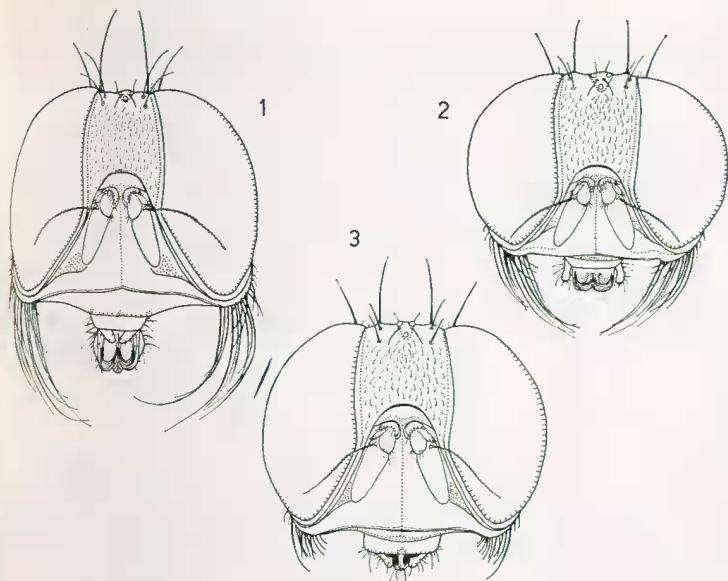
The species of the family Platystomatidae exhibit a wide range of secondary sexual modifications especially in males. Observations of the living flies have rarely been made, but it is probable that the function of a greater proportion of these modifications would be understood if a more detailed knowledge of sexual behaviour could be achieved. Previously (McAlpine, 1973b) I have indicated that some secondary sexual modifications in the Platystomatidae play a role in mating. Here structural adaptations for fighting are considered.

### Sexual modifications of the platystomatid head

In larger males of *Pogonortalis doclea* the head is widened across the ventral extremity of the genofacial region so that the subcranial (peribuccal) region is exceptionally broad (Fig. 1). Thus the head is almost as wide across the lowest part of the cheeks as it is across the widest part of the eyes. Females and smaller males have the head considerably wider across the eyes than across the lower part of the cheeks (Figs. 2 & 3). Both large and small males have a fascicle of numerous enlarged, curved bristles on each cheek. In the female there is a single moderately developed cheek bristle and some smaller hairs near it (Fig. 3).

In males of a number of other platystomatid genera there is a conspicuous widening of the head. In *Cleitamia astrolabei* (Boisduval) the male has a widened head, while in the exceedingly similar species *C. orthocephala* Hendel the male has a normal head like that of the female (Malloch, 1939). Varying degrees of head-widening occur also in males of the genera *Asyntona*, *Atopognathus*, *Brea*, *Mesoctenia*, *Trigonosoma*, *Zygaenula*, and *Pterogenia* (but not in the known Australian species of the last). In *Mesoctenia australis* McAlpine from Queensland and an undescribed species of *Mesoctenia* from New Guinea the widening is accompanied by production of the epistomal region into a large lobe (McAlpine, 1973a, Fig. 5). In the male of *M. coalescens* (Hendel) from New Britain the head is conspicuously widened but there is no trace of the epistomal lobe.

In the genera *Achias*, *Achiosoma* and *Laglaizia* the modification of the head takes the form of protuberant or stalked eyes, through the lateral extension of the orbital region of the head capsule of the males. Stalked



FIGS 1-3. Heads (front view) of *Pogonortalis doclea*, all to same scale. (1) head of a large male; (2) head of a small male; (3) head of a female.

eyes also occur among members of the following acalyprate families: Tephritidae, Otitidae, Richardiidae, Micropezidae, Diopsidae, Periscelididae.

Elongate processes of the cheek occur in males only of one or more species of the genera *Clitodoca*, *Angitula* (= *Hammatopelma*), *Giraffomyia*, and *Apiola* (= *Xenognathus*). Much shorter lamellate extensions of the cheek occur in *Neohemigaster*, *Pterogenia*, and *Mesoctenia* among the Platystomatidae, and *Diplochorda* of the family Tephritidae. Spectacularly elongate processes of the cheek also occur in males of certain Tephritidae (*Phytalmia*, *Terastiomyia*) and Clusiidae (*Labomyia*).

No specialised condition of head structure is known to occur only in the female sex of any platystomatid species. The female always approximates to the norm when there is sexual dimorphism of the head, the norm being considered as the condition of the head in related species without such sexual dimorphism. On the other hand female platystomatids sometimes show particular modifications of the thorax and preabdomen in the genera *Plagiostenopterina* and *Euprosopia* (see McAlpine, 1973a, 1973b).

#### Combat in *Pogonortalis doclea*

Numerous individuals of *Pogonortalis doclea* were observed on low vegetation and fallen leaves in dry sclerophyll forest at Castlecrag, near Sydney, New South Wales, on 13th February, 1974.

Several different kinds of movement were observed when these flies encountered flies of the same or another species. A slow approach to the other fly with wings depressed and extended forwards seemed to indicate cautious investigation, as it resulted in either aggression, retreat or neutral

behaviour, depending on the nature of the other individual. A more rapid approach with wings vibrating slowly often preceded aggression (described below), but was not very different from walking in the absence of other flies.

Frequently, when two individuals met, a tussle ensued. Whenever it was possible to determine the sex of the contestants, they were males and it is possible that no females were involved in this kind of behaviour. The contestants pressed the facial regions of their heads together and raised the anterior parts of their bodies so that their longitudinal axes formed an angle of as much as  $60^\circ$  with the substrate. In several cases the cheek bristles of the rivals were apparently interlocked. All tarsi remained on the substrate, as the two flies pushed against one another. After a few seconds one fly was pushed back and flew away, the victor remaining on the leaf. In one case where the size of the combatants was very unequal, the smaller individual was vanquished in a very short time.

### Discussion

The aggressive behaviour of the males of *P. doclea* almost certainly serves to maintain suitable territory in which courting of females may occur. Fighting for territory is a well known phenomenon in Diptera and among the acalyptrate flies has been reported for *Gymnonerius fuscus* (Wiedemann) (family Neriidae) by de Meijere (1911), for "*Cardi-cephala myrmex*" (now *Plocoscelus arthriticus* (Weidemann), family Micropezidae) by Wheeler (1924), and for *Zygothrica dispar* Wiedemann (family Drosophilidae) by Bristowe (1925). Spieth (1952) omits mention of territorial fighting in his survey of mating behaviour in *Drosophila*, but mentions aggression between males in vitro in a number of Hawaiian drosophilids (Spieth, 1966). In the wild this aggressiveness could possibly take the form of territorial behaviour. Bush (1966) records territorial fighting among males of *Rhagoletis* (family Tephritidae) and it is possible that it occurs widely among flies of this family.

In many animals the competition for a mate is much more stringent among males than among females. This is generally the case in Diptera where a female need only mate a few times (sometimes once in a lifetime) for maximum reproductive activity, whereas a male has the potentiality for a large number of effective matings. As each sex is produced in similar numbers most females receive sufficient sperm to fertilise most of their ova, without competition with other females. Males collectively have the potential of fertilising far more ova than the females produce and therefore compete for the limited number of matings required by the females. Hence high selective pressures act on the males for proficiency in obtaining a mate.

The function of the widening and other modifications of the head in males of certain platystomatids and other acalyptrate flies has not been explained adequately. A full understanding will only be obtained by protracted studies of living insects. The apparent territorial fighting observed in *P. doclea* provides the first direct evidence of the use of any of these cephalic modifications in any platystomatid. The broadened facial region and enlarged cheek bristles appear to render the males more efficient in butting their opponents by preventing the latter from slipping sideways and thus avoiding the repulse.

Extrapolating from the case of *P. doclea*, it is reasonable to hypothesise that many of the other platystomatid species with modified male heads may also be thereby adapted to territorial defence. The broadened heads of males in many genera and the stalked eyes in males of *Achias* and *Laglaizia* all appear well suited to this function. In the clusiid flies *Clusiodes gladiator* McAlpine, *Hendelia beckeri* Czerny, and *Parahendelia latifrons* McAlpine the broadened head and much enlarged vibrissae are reminiscent of the head modifications of *Pogonortalis doclea*, and it is feasible that they are used in a similar manner. The cheek processes in males of certain species of *Angitula* and *Clitodoca* correspond strikingly in position and extent with the fascicle of cheek bristles in *Pogonortalis* and again it seems possible that they are put to similar use.

The only other acalyptrate fly which has been recorded as using its highly modified head in fighting other males of its species is *Zygothrica dispar* Wiedemann. Bristowe (1925) has made an interesting comparison between the use of the horn-like extensions of the male head in this fly and that of the horns of bovid mammals. His illustration and description of male fighting in *Zygothrica* show a striking similarity to the fighting between males of such bovids as Cape Buffalo (*Syncerus caffer*) and Waterbuck (*Kobus defassa*) which I have observed in Aberdare National Park, Kenya. In many of the bovids and cervids only males carry the horns or antlers, and they are used primarily in contests between males either for females or for mating territory. It therefore appears that essentially the same selective forces have produced, or at least maintained, the head modifications found in ruminants and the flies *Pogonortalis* and *Zygothrica*. It is now suggested that this kind of selection may have operated much more widely among the acalyptrate Diptera.

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